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ABSTRACT

This student manual, the fourth in a set of 14 modules, is designed to train emergency medical technicians (EMTs) in Ohio. The module contains two sections covering the following course content: vital signs (temperature, pulse, respirations, and blood pressure) and patient assessment at the scene of an emergency. Each section contains objectives, an introduction, and information text. The text is illustrated with line drawings and photographs. (KC)

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EMERGENCY VICTIM CARE

Module 4

—Vital Signs
—Patient Assessment

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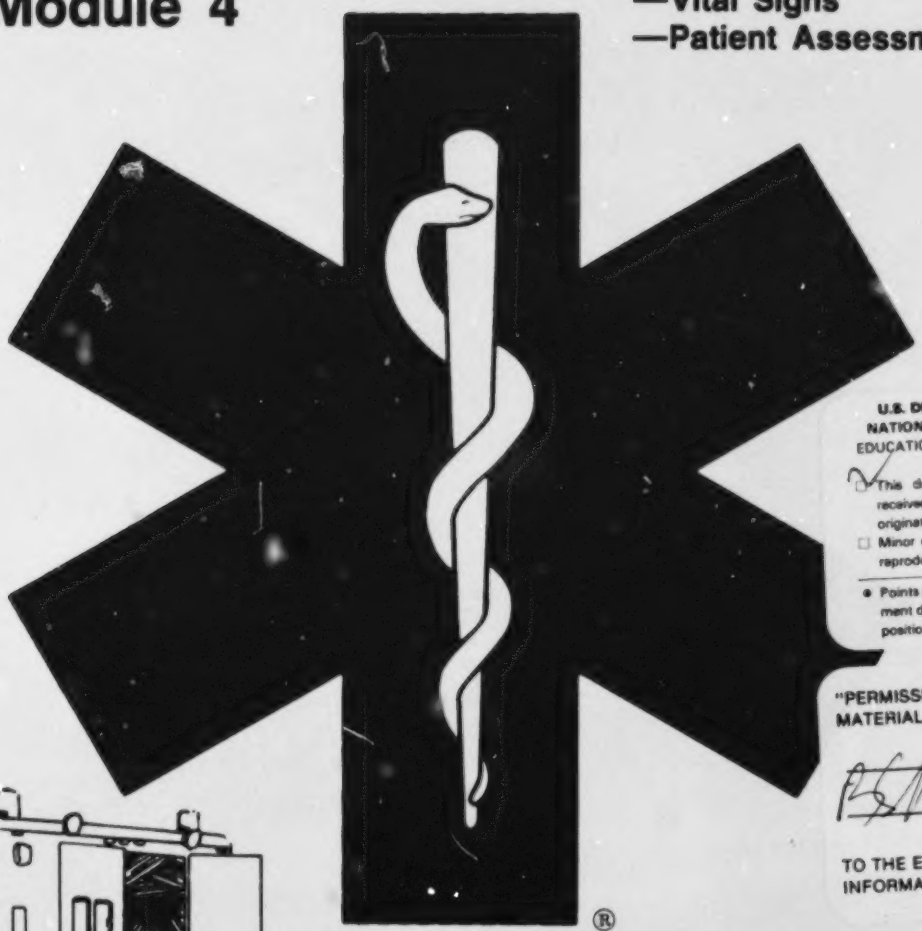

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EMERGENCY VICTIM CARE

A TRAINING MANUAL FOR EMERGENCY MEDICAL TECHNICIANS

OHIO TRADE AND INDUSTRIAL EDUCATION SERVICE

DIVISION OF VOCATIONAL EDUCATION
STATE DEPARTMENT OF EDUCATION
COLUMBUS, OHIO

TO THE LEARNER

The 1983 Emergency Victim Care textbook revision has been grouped into 14 modules. The modules have been grouped by content matter as follows:

Module 1

Preface
Foreword
Acknowledgment
Student-Instructor Relationship

Personnel
Emergency Medical Service Vehicles
EMS Communication
Records and Reports

Module 2

Equipment
Safe Driving Practices
Legal Aspects
Controlling the Situation
Action Evaluation Conference

Module 3

Anatomy & Physiology

Module 4

Vital Signs
Patient Assessment

Module 5

Cardiopulmonary Resuscitation (CPR)

Module 6

Bleeding Control
Wounds and Bandaging
Shock

Module 7

Medical Emergencies

Module 8

Crisis Intervention
Drug-Related Problems

Module 9

Backboards/Moving and Handling the Victim
Fractures
Dislocations

Module 10

Injuries of the Eye, Ear, Nose, Abdomen, C.N.S. and Genitalia
Burns and Environmental Injuries

Module 11

Childbirth
Pediatric Emergency

Module 12

Water Accidents
Electrical Emergencies
Hazardous Materials and Radiation Accidents

Module 13

Extrication from Automobiles

Module 14

Appendix I: Communicating with Deaf and Hearing Impaired Patients
Appendix II: Medical Terminology
Appendix III: EMS Organizations
Appendix IV: Legislation
Glossary of Terms
Index

MODULE 4

TABLE OF CONTENTS

Vital Signs 1

Patient Assessment 11

VITAL SIGNS

OBJECTIVES

Upon completion of the following chapter, you will be able to:
- —define each vital sign:
  - —temperature
  - —pulse
  - —respiration
  - —blood pressure
- —describe procedure to accurately measure and record each vital sign for adults and children:
  - —temperature
  - —pulse
  - —respiration
  - —blood pressure

Following instruction and/or practice you will be able to:
- —demonstrate measuring the temperature of an adult.
- —demonstrate measuring the temperature of a child.
- —demonstrate measuring the pulse of an adult.
- —demonstrate measuring the pulse of a child.
- —demonstrate checking respirations of an adult.
- —demonstrate checking respirations of a child.
- —demonstrate measuring blood pressure of an adult.

INTRODUCTION

The importance of emergency medical care between the scene of an accident or serious illness and the hospital emergency department is being stressed more each day. Emergency care starts at the scene, and the EMT's care is very important. Observations made by the EMT are of vital importance to hospital personnel.

Four useful indicators of body functions are temperature, pulse, respiration and blood pressure; these are the **vital signs.** Variations above or below the normal ranges can indicate the presence of serious illness or severe injury. By repeating observations of the **vital signs,** any changes outside the normal ranges can be observed and the proper treatment started. It must also be remembered that any **vital sign** observed outside normal ranges must be reported to medical personnel.

TEMPERATURE

DEFINITION

Temperature may be defined as the balance between heat production and heat loss. Temperature is measured by means of a clinical thermometer. The thermometer is calibrated according to Fahrenheit or Centigrade scales. The Farenheit scale is the most common scale found on a thermometer at this time and will be the scale that is discussed in this chapter.

Body temperature of adults, unless contraindicated, is taken in the mouth since this is the best convenient and comfortable method. Temperature readings must be accurate and should always be recorded.

TYPES OF THERMOMETERS

There are two types of thermometers, the oral and the rectal. See Figure 1. An easy way to distinguish between the two is to note that the oral thermometer usually has a long, narrow bulb and the rectal thermometer has a short, thick bulb. (Some manufacturers use a color code.)

NORMAL RANGES

There are three (3) routes of taking temperatures — oral, rectal and axillary. Each of these routes has a normal range for most adults.

Axillary	97°-98°
Oral	98°-99°
Rectal	99°-100°

The EMT should not be greatly concerned with a temperature unless it is outside these ranges. However, it should be recorded along with the time it was taken. Examples: 98.5° 10:45 A.M.

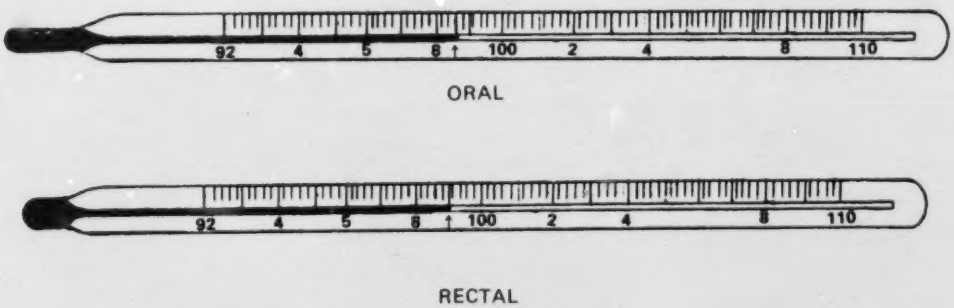


Figure 1. Types of thermometers

There are many reasons that a temperature might change. Infection, dehydration, fright, anxiety, and trauma are just a few conditions that could influence the body temperature to rise. Exposure and shock are the two most common reasons for a lower than normal temperature. If a temperature goes too far above normal, it can cause convulsuions, or even brain damage can occur if the temperature is high enough and remains high for a period of time.

Children normally have temperatures slightly higher than those of adults. (Remember, their metabolism is more rapid than metabolism in adults.)A temperature of up to 100.5°F. is generally considered within normal limits if no other signs of illness are present (e.g., headache, fatigue, lethargy, nausea, pain, irritability, etc). A temperature of over 101°F. is considered to be a fever. Children tend to have convulsions (seizures) with a temperature over 104°F.

PROCEDURES

Before taking a temperature:

1. Wash hands if possible.

2. Check thermometer for breakage.

3. Clean thermometer with a disinfectant and rinse.

4. "Shake down" the thermometer if it reads about 95°. (To shake down a thermometer, grasp tightly at the top of the thermometer and shake in a snapping action. Your wrist must remain loose.)

5. If victim has had hot or cold liquids or has been smoking you should delay taking the victim's temperature for a few minutes. Under these conditions a false reading might be obtained.

6. Explain procedures to the victim.

Oral Temperature—This is normally the most desirable method used by the EMT. However, for safety reasons it should not be used on victims who are unconscious, disoriented or under six years of age.

Procedures to follow when taking an oral temperature:

1. Place ball of thermometer under victim's tongue, just behind lower gum. Have victim close lips.

2. Leave thermometer in mouth three (3) minutes.

3. Remove thermometer; hold at top at all times.

4. Rotate thermometer until mercury column can be seen clearly. Read accurately. If reading is questionable recheck temperature and/or thermometer if necessary.

5. Record temperature and time taken.

6. Clean thermometer, or place in container to be cleaned later.

NOTE: When cleaning a thermometer it should be washed with cool water, then sterilized with a disinfectant, then rinsed in cool water. If it had been placed in its container first, the container must also be cleaned, following the same procedures.

Axillary Temperature—This is the second most desirable method used by the EMT; however, it is the least accurate.

Procedures to follow when taking an axillary temperature:

1. Remove clothing on the arm to expose armpit.

2. Place ball of thermometer directly into depth of armpit.

3. Hold thermometer by the top and hold in place at least three minutes.

4. Remove thermometer; hold at top at all times.

5. Rotate thermometer until mercury column can be seen clearly. Read accurately. If reading is questionable recheck temperature and/or thermometer if necessary.

6. Record temperature. Be sure to place "(A)" for "axillary" route after temperature reading and time. Example: 98.6° (A) 10:45 A.M.

7. Clean thermometer, or place in container to be cleaned later.

Rectal Temperature—This is the lease desirable method used by the EMT. However, it is the most accurate. It should not be used if victim is a cardiac victim or has severe rectal problems.

Children under the age of six years of age should have their temperature taken rectally. Children who are unconscious or disoriented regardless of their age should have their temperature taken rectally.

Procedures to follow **before** taking a rectal temperature: (Same as Oral)

Procedures to follow when taking a rectal temperature:

1. If victim is conscious, explain what you are doing.

2. Turn victim on noninjured or least injured side.

3. Rotate thermometer into lubricant until ball and one inch above is well lubricated.

4. Lift upper cheek of buttocks to expose anus.

5. Insert thermometer into rectum, two inches in adults; one inch in infants and small children.

6. Hold thermometer in place for at least two minutes. Do not allow victim to roll onto back. Provide support. If resistance is met, remove and start over.

7. Remove thermometer; hold at top at all times.

8. Wipe thermometer clean from tip down with tissues.

9. Rotate thermometer until mercury column can be seen clearly. Read accurately. If reading is questionable recheck temperature and/or thermometer if necessary.

10. Record temperature. Be sure to place "(R)" for "rectal" route after temperature reading and time. Example: 98.6° (R) 10:45 A.M.

11. Clean thermometer, or place in container to be cleaned later.

The preceding are proper methods used to find a victim's temperature. It must be realized, however, that the taking of a victim's temperature at the scene of an accident or sudden illness will not always be practical. Therefore, the EMT must remember the skin is largely responsible for regulation of body temperature and changes in skin temperature can indicate to the EMT that changes are occurring within the victim's body. The EMT can feel the victim's skin surface at several locations with the back of the hand to acquire a "rough" but quick evaluation concerning temperature.

PULSE

The pulse may be defined as a wave of blood which passes along the artery as the heart contracts. The wave is caused by the force of the blood against the arterial wall each time the heart beats, therefore the pulse rate is normally the same as the heart rate.

The pulse is one of the **vital signs** since it indicates not only the condition of the heart but also the general condition of the individual.

Injuries, sudden illness, strong emotions and activity can cause drastic changes in a victim's pulse rate.

The pulse is taken where an artery may be compressed against a bone. The radial arteries are most conveniently reached and are the most commonly used. The carotid (used normally when the victim is unconscious), the femoral and brachial arteries are also used.

The pulse can also be found and checked by listening to the heart with a stethoscope. This is done over the apex or tip of the heart, which is normally found on the left side of the chest slightly below the nipple. This is called the apical pulse.

The normal range for a pulse in an adult is 60-100 beats per minute.

When checking a victim's pulse the EMT will determine the rate and the character; that is namely rhythm and volume. The **rate** is the beats per minute. One way of determining the rate is to count the pulse for one full minute. However, if the pulse is regular you can count for only 30 seconds (½ minute) and double it. **Rhythm** is the regularity. Is it regular or irregular? **Volume** is the strength. A normal pulse will feel strong and full in volume. If the volume is diminished, the pulse feels weak and thin. This is many times referred to as a **thready pulse.**

Procedures for taking a pulse:

1. Have the victim relax. Have the victim's arm resting comfortably (for the radial pulse), preferably across the lower part of the chest. See figure 2.

2. Use three fingers to find the pulse. Use only the tips of the fingers and never the thumb. (If the thumb is used, the EMT's own pulse might be felt.)

3. Avoid too much pressure. Pressing in too hard may stop the pulse.

4. Count and observe the pulse for 30 seconds to one minute. (Take cardiac victim's pulse for one full minute.) Use watch with second hand.

5. Record pulse rate, rhythm and volume and the time taken. Example: Pulse 72, regular, full — 10:50 A.M.

Figure 2. Taking pulse

NOTE: A slow heart rate (normally under 60) is known as bradycardia or a fast heart rate (normally over 100) is known as tachycardia.

The feeling of a pulse in an infant is more of a problem. Unfortunately, the very short and sometimes fat neck of an infant makes the carotid pulse difficult to locate. Because of this difficulty, it is recommended that in infants the brachial pulse be checked. (See Figure 3.)

Figure 3. Palpating the brachial pulse

As the child grows, use of the more common peripheral vessels becomes possible. When caring for a child try several of the pulse sites until you find the one that is easiest for you and will give you the best and most accurate information.

RESPIRATIONS

Respirations, one of the vital signs of the body, are exchanges of gases, oxygen (0_2) and carbon dioxide (CO_2) between the blood and air in the lungs. Respirations include both inspiration and expiration and are referred to as external respirations. Twelve to 20 respirations per minute is considered the normal range for an adult. When observing respirations, the character (shallow, noisy, deep) as well as the rate (times per minute) must be considered. Since the respirations are partially under voluntary control, it becomes necessary that respirations be counted in such a way that the victim is unaware of the procedure. Usually the respirations are observed immediately after taking the pulse.

Injuries, sudden illnesses, strong emotions, and activity can cause drastic changes in a victim's respirations.

Procedures for checking respirations:

1. If possible, place victim's arm across lower part of chest. Hold victim's wrist as though you are still checking the pulse.

2. Count the respirations by watching and feeling the rise and fall of the chest as the victim breathes. Each rise and fall equals one (1) respiration.

3. Count for one (1) full minute (use watch with good second hand) while observing depth and regularity.

4. Record respiration rate and character. Example: Resp. 15 — normal 10:50 A.M.

Movement of the chest in young children is not as prominent as in adults and usually occurs closer to the abdomen. A hand placed lightly over the lower chest and upper abdomen can facilitate the check for respiratory activity. See Figure 4. Because of the relatively small volume and force of air flow, it is also nearly impossible to hear normal breathing or feel air moving through the mouth and nose.

Figure 4. Checking respiratory activity.

BLOOD PRESSURE

Blood pressure is defined as the force exerted by the blood against the walls of the arteries. It is one of the vital signs. The victim's blood pressure should be taken often in order to note any change in the victim's condition. The victim should have the procedure explained before it starts since emotional stress can result in a false reading.

If the measurement is outside the normal ranges the procedure should be repeated every five to 10 minutes.

Information concerning the blood pressure reading should not be given to the victim by the EMT. The decision to give the victim this information should be left to the hospital physician. Good judgment and common sense should be used in handling this type of situation.

The technical term for the contraction of the heart is systole. Therefore, the blood pressure reading corresponding to the contraction of the heart is the **systolic** reading. The technical term for the resting period of the heart is diastole. Therefore the blood pressure reading corresponding to the resting period of the heart is the **diastolic** reading.

Blood pressure readings are recorded like improper fractions with the higher reading over the lower. If the victim's systolic blood pressure is 126 and the diastolic is 82, the EMT would record the B/P as 126/82.

Blood pressure is influenced by the force of the heartbeat. The greater the force, the higher the blood pressure and the volume of blood. The less blood flowing through the arteries, the lower the blood pressure will be.

The normal ranges for blood pressure measurements in adults are:

Systolic — 100 mm to 140 mm

Diastolic — 60 mm to 90 mm

Blood pressure is measured by the use of a sphygmomanometer. ("Sphygmo" means related to pulse and "manometer" means an instrument for measuring pressure.) There are two types of sphygmomanometers (B/P cuff): the anaeroid and the mercury. The anaeroid is recommended for the EMT. See Figure 5. Both have an inflatable cuff that is wrapped around the victim's arm and a rubber bulb that is used to pump air into the cuff. On the mercury sphygmomanometer, the air that is pumped into the inflatable cuff is forced through a rubber tube into a reservoir of mercury. This forces the mercury up the glass tube which is bordered by a scale. The scale into which the mercury is forced is calibrated in millimeters (mm). A blood pressure reading is given in millimeters of mercury.

An anaeroid sphygmomanometer has a dial rather than a scale. The readings on both kinds of sphygmomanometers are the same in that both are calibrated in millimeters of mercury.

A stethoscope is also used when recording a victim's blood pressure.

The ear canal runs slightly forward. The ear pieces of the stethoscope are slightly bent and should be placed in the EMT's ears so they point forward.

Procedures for checking blood pressure (B/P):

1. Assemble equipment (if necessary).

2. Place equipment so it can be seen easily.

3. Explain procedure to victim (if conscious).

4. Assist victim to a comfortable position, reclining or sitting, but only if condition allows.

5. Raise sleeve well above elbow, remove if it it is too tight. Be sure clothing is not constricting the upper arm.

6. Extend the victim's arm with palm up. Be sure arm is well supported.

7. Be sure all air is out of the cuff. Wrap the deflated cuff around the upper arm. Apply cuff

Figure 5. B/P cuff [anaeroid] and stethoscope

well above elbow with the tubes from the cuff extending downward toward the victim's hand. Center the compression bag (located in the cuff) over the brachial artery high enough so it will not interfere with placing of the stethoscope. If at all possible, use uninjured arm.

8. Fasten the cuff securely. It should fit smoothly and snugly but not too tightly.

9. Close the valve near the bulb by turning the screw clockwise.

Figure 6. Applying stethoscope

10. The EMT must be in position to look straight at the dial or be at eye level with the top of the mercury gauge.

11. Locate the brachial artery on inner aspect of elbow.

12. Pump air into cuff by squeezing bulb (this should be done quickly). Elevate dial or mercury column until pulse is no longer felt. Place stethoscope over inner aspect of the elbow. See Figure 6.

13. Open the valve near the bulb by turning counterclockwise with thumb and index finger and **slowly release air.** Continue releasing air until the first prominent thumping sound is heard, and observe the number on the dial or mercury column. This is the systolic pressure. **Use only even numbers.**

14. Continue to listen while releasing air from the cuff until the sound stops. Observe the number on the dial or mercury column. This is the diastolic pressure. **Use only even numbers.**

NOTE: Once air release is started, do not stop. Do not reinflate cuff. If numbers are missed deflate cuff to zero and start over.

15. Release all air from cuff when last sound is heard. Be sure readings are correct. If unsure, wait one minute and repeat. If readings are questionable, use other arm. Do not alarm victim.

16. Remove cuff from victim's arm, and replace in container.

17. Record blood pressure and time. Example: B/P 126/84 10:55 A.M.

18. If indicated, retake B/P every five to 10 minutes. Record each time taken.

Blood pressure measuring requires much concentration and practice before the EMT can excel in this procedure. When practicing, the EMT should avoid overuse of the arm of the person being measured.

PALPATING THE BLOOD PRESSURE

This method of taking a B/P will only give the EMT the systolic pressure and is not as accurate. In a moving vehicle, however, it may well be the only way; and it will give the general trend of systolic pressure.

Procedure for palpating the B/P:

1. Place fingertips on radial pulse.

2. Inflate B/P cuff past the point where the pulse ceases.

3. Slowly deflate cuff, watching dial or mercury column.

4. When pulse appears (felt at wrist), this is the approximate systolic pressure.

5. Record blood pressure, time, and method used. Example: B/P 126/(palpated) 10:55 A.M.

Blood pressures are difficult to obtain on infants and are frequently of little value except in select cases. If blood pressures are to be taken the cuff should be one-half to two-thirds the width of the portion of the extremity to be used. (Larger cuffs give false low readings and smaller cuffs give false high readings.) Two methods are commonly used to obtain a blood pressure. The first is palpation.

The second method employs the use of a stethoscope. If this method is used, the stethoscope should have a diaphragm small enough to occlude the area over the pulse site. (Pediatric stethoscopes are available.)

NOTE: If blood pressures are taken on a seriously ill or injured child who is being transported to the hospital, or if the blood pressure is notably abnormal, it can be of help if the cuff is left on until the child is in the emergency room. This helps the emergency room personnel evaluate the size of the cuff that has been used, the extremity chosen, and determine differences that may be attributed to possible change in cuff size once the child is in the emergency room. The emergency room personnel can then check the blood pressure using your cuff for comparison with your prior readings.

As stated at the beginning of this chapter, a victim's vital signs at the scene of the emergency and en route to the hospital are very important to the hospital personnel. Therefore, the EMT must become proficient both in the skills used and the knowledge of vital signs. This can be accomplished only if the EMT is willing to continuously practice the procedures described in this chapter.

AGE	TEMPERATURE	PULSE	RESPIRATION	BLOOD PRESSURE SYSTOLIC	BLOOD PRESSURE DIASTOLIC
Newborn	99°-99°	136-140	28-32	60-90	30-60
1 year	99°-99²	130-136	28-30	60-100	50-70
2 years	98⁸-99²	100-106	24-28	65-110	40-90
3 years	98⁸-99°	92-94	24-26	70-110	40-90
4 years	98⁸-99°	86-90	24-26	76-120	46-86
5 years	98⁴-98⁶	82-86	22-26	80-120	45-60
6 years	98⁴-98⁶	78-80	20-24	80-120	45-60
7 years	98⁴-98⁶	74-78	20-24	85-120	45-65
8 years	98²-98⁴	74-78	20-22	90-120	48-64
9 years	98²-98⁴	72-74	18-22	95-120	48-64
10 years	98°-98²	68-72	18-20	95-120	48-64
11 years	98°-98²	65-70	18-20	95-130	48-68
12 years	98°-98²	65-70	18-20	95-130	48-68
13 years	97⁸-98°	65-70	18-22	95-130	48-68
14 years	97⁶-98°	64-70	18-20	100-135	50-70
15 years	97⁶-98°	60-68	16-18		
16 years	97°-98°	60-66	16-18		
17 years	97°-98°	60-68	16-18		
18 years	97°-98°	58-68	15-20		

Not all records agree as to the "normal" range for vital signs for children and often there are noticeable variations. The figures given here are to be considered only as guidelines for what might be expected of a well child at rest. The trend of the vital signs, either up or down, as well as their quality and the relationship to what has happened or is happening to the child should, therefore, be considered before any emergency treatment is administered.

PATIENT ASSESSMENT

OBJECTIVES

Upon completion of the following chapter, you will be able to:

—describe procedures to make a thorough examination of a victim's condition so proper emergency medical care can be initiated.
—describe procedures to perform a neurological evaluation of the central nevous system when a head injury is suspected.
—describe and interpret a medical alert symbol.
—describe proper procedures in handling a multiple casualty emergency.

Following instruction and/or practice, you will be able to:

—perform a primary examination for patient assessment.
—perform a secondary examination for patient assessment.
—perform a neurological examination of the central nervous system.
—triage victims in a multiple casualty.

INTRODUCTION

Before administering emergency care, the EMT must make a rapid, but thorough examination of the victim to determine the extent of life-threatening injuries, and take necessary supportive action. A survey must then be made for additional non-threatening injuries, administering necessary emergency care and preparing the victim for safe transportation to the hospital.

PRIORITY OF EMERGENCY CARE

Absence of breathing must be considered the number one emergency and the EMT will exert every effort to establish an open air passage and to ventilate the victim immediately.

Once breathing has been established, all **bleeding** must be controlled, followed by the **treatment for shock.**

PROCEDURES FOR PATIENT ASSESSMENT

To properly evaluate the victim's condition, the EMT will utilize as many of the senses as possible. See Figure 1. The EMT must feel, talk to, and observe the victim simultaneously to determine the extent of injury.

Feel—EMTs can to some degree determine the presence of respiration by feeling for air movement on their own cheeks. In feeling the pulse, an absence of pulse indicates no circulation and cardiac arrest, and a weak pulse will indicate

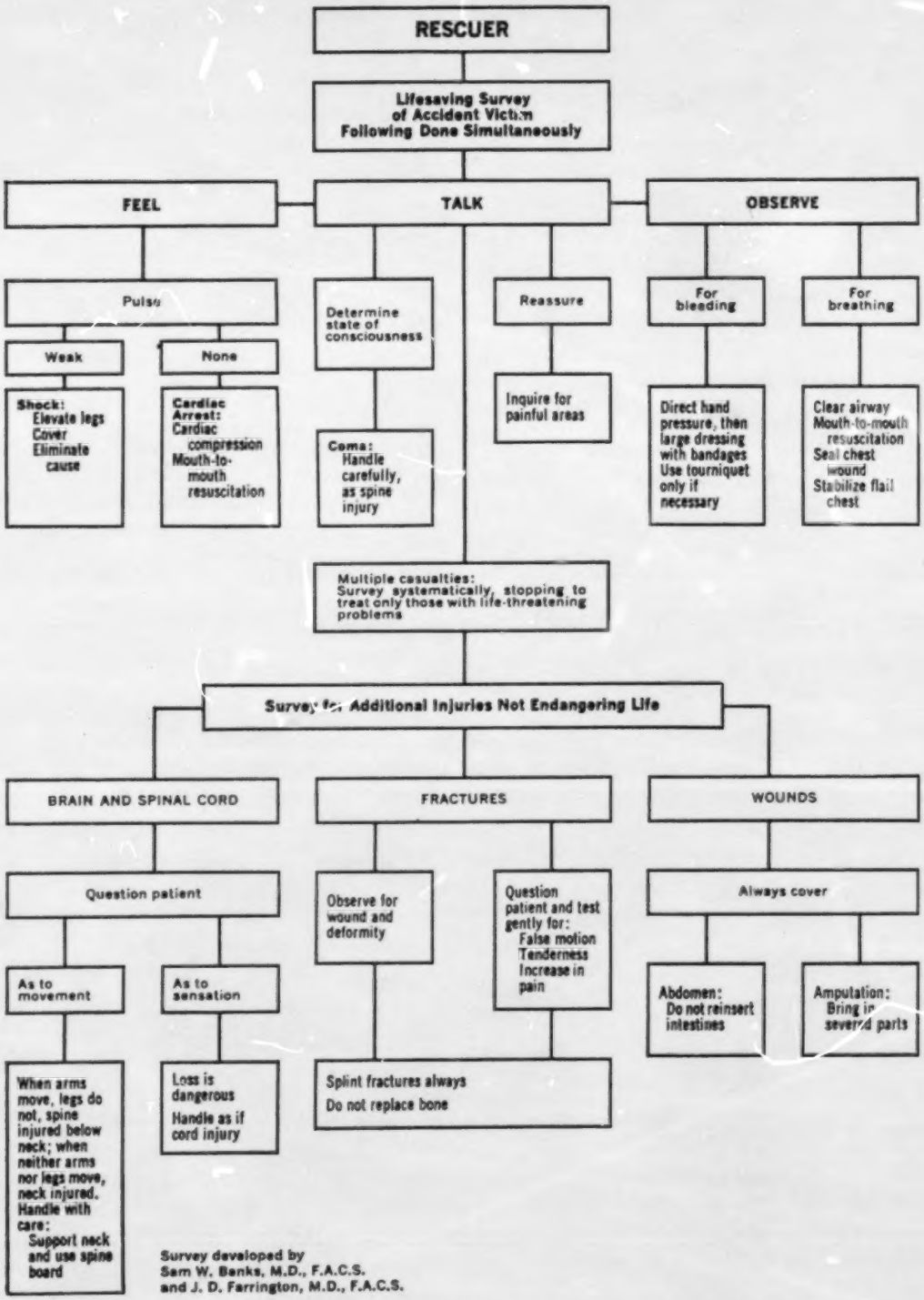

RESCUER
Lifesaving Survey of Accident Victim Following Done Simultaneously
FEEL
TALK
OBSERVE
Pulse
Weak
None
Shock: Elevate legs Cover Eliminate cause
Cardiac Arrest: Cardiac compression Mouth-to-mouth resuscitation
Determine state of consciousness
Coma: Handle carefully, as spine injury
Reassure
Inquire for painful areas
For bleeding
Direct hand pressure, then large dressing with bandages Use tourniquet only if necessary
For breathing
Clear airway Mouth-to-mouth resuscitation Seal chest wound Stabilize flail chest
Multiple casualties: Survey systematically, stopping to treat only those with life-threatening problems
Survey for Additional Injuries Not Endangering Life
BRAIN AND SPINAL CORD
FRACTURES
WOUNDS
Question patient
As to movement
As to sensation
When arms move, legs do not, spine injured below neck; when neither arms nor legs move, neck injured. Handle with care: Support neck and use spine board
Loss is dangerous Handle as if cord injury
Observe for wound and deformity
Question patient and test gently for: False motion Tenderness Increase in pain
Splint fractures always Do not replace bone
Always cover
Abdomen: Do not reinsert intestines
Amputation: Bring in severed parts
Survey developed by Sam W. Banks, M.D., F.A.C.S. and J. D. Farrington, M.D., F.A.C.S.

Figure 1. Procedures for patient assessment

shock. Gently feeling the extremities may reveal slight deformities or grating sensations that will indicate a fracture.

Talk—The EMT should reassure the victim as to the problem. Under no circumstances should the EMT speculate on the outcome of the victim's condition. The EMT should assure the victim that help is present and that everything possible will be done. EMTs should tell their victims they are trained and capable of providing emergency care.

One of the most important aspects of patient assessment is to obtain information about the patient's history. The approach used by the EMT is an important factor in regard to how well the victim may accept emergency treatment. In communicating with the victim, it is important to listen to what the victim has to say. The EMT should not suggest signs and/or symptoms. Ask open-ended questions to probe for information. Some questions which can be asked may be:

—When did the pain begin?
—Where does it hurt?
—How does it feel?
—What makes you feel better or worse?

It is also important to obtain some past medical history about the patient. Remember to ask as many questions as necessary to get "AMPLE" information. All patient information should be relayed immediately to the emergency room personnel or attending physician.

This simple pattern may be helpful.

A—Allergies, alert tags
M—Medications
P—Past medical history, diseases, serious illnesses or injuries
L—Last meal or beverage
E—Events of this episode

Observe—While examining and talking, the EMT is simultaneously observing the victim. The EMT should look for bleeding and deformities of a body part while constantly observing the victim for changes in respiration, color, restlessness and signs of nausea, and possible loss of sensation or function that may indicate a neck or spinal injury.

APPROACH TO PATIENT ASSESSMENT

The following is a systematic approach to the proper examination of an accident victim.

During this examination, the EMT should use all the senses as stated — look, listen, feel, and smell. Start at the head and go to the toes.

Ask questions pertaining to the history of the accident (ask victim and witnesses). The EMT can also learn a great deal about the victim's condition by checking the accident site and injury producing mechanism. See Table 1.

USE GOOD COMMON SENSE. DO NOT MOVE THE VICTIM MORE THAN NECESSARY.

PRIMARY EXAMINATION

A **primary examination** is carried out immediately and pertains to life-threatening conditions.

1. **Airway**—A check of the airway is extremely important for a patient in cardiac arrest or a patient experiencing airway obstruction. However, it is also important to check the airway of the patient not exhibiting signs of an airway problem. The airway should **always** be checked to insure it is open and stays open. Oxygen, if needed, should be administered.

Although a patient is breathing, supportive airway equipment may be needed. For example, an oropharyngeal airway should be inserted in the unconscious victim to protect the airway. If the victim is conscious enough that the oral airway stimulates a gag reflex or if the victim

INJURY-PRODUCING MECHANISMS	POSSIBLE INJURIES
Auto Accidents	
Bent steering wheel or collapsed steering wheel	Abdominal injuries, severe chest injuries, fractured ribs
Broken windshield, damaged dashboard	Head injuries, arm and shoulder injuries
Broken inside door latches or window handles	Penetrating wounds (possible sucking chest wound)
Seat belts still in place	Pelvic injuries, internal abdominal injuries
Shoulder straps in place	Injuries to clavicle
Fires	
Flames	Burns
Heavy smoke	Smoke inhalation, carbon monoxide, internal burns of the nose, mouth, pharynx and trachea, even the lungs could be involved
Falls	
Down stairs	Spine injuries, all types of fractures including head injuries
Direct fall - in most cases the greater the distance the greater the injuries	Spine injuries, all types of fractures, internal injuries
Explosions	Burns, internal bleeding & injuries, fractures, spine injuries, head injuries
Gun Shot	Internal bleeding, fractures (look for exit wound)
Electric Shock	Cardiac arrest, respiratory arrest, burns (look for exit burn)

Table 1. Injury Producing Mechanisms

rejects the oral airway, this is a good sign. If the victim does not reject the airway, it is a sign that it is needed. It also may mean the EMT should assist respirations, even if the patient is still breathing. Count the respirations. Remember, a person may not appear to be ill when complaining of shortness of breath. A respiratory rate of 40 may be the only signs of a serious problem.

2. **Pulse**—Check for carotid pulse. If none is found, start C.P.R. procedures immediately.
3. **Bleeding**—Control all severe bleeding.
4. **Shock**—Take the victim's blood pressure as soon as possible. A low B/P (Systalic under 90 mmHq) accompanied with a fast pulse rate should lead you to suspect in-

NOTE: THIS SECONDARY EXAMINATION SHOULD BE CARRIED OUT WITH THE VICTIM PARTIALLY OR COMPLETELY COVERED WITH PROTECTIVE COVERING IF THE WEATHER SO WARRANTS IT.

Figure 2. Overview of a secondary examination

ternal bleeding and possible hypovolemic shock. Control shock as soon as possible.

After performing the primary examination, if the victim is found to have life-threatening injuries, a high degree of priority for transportation is warranted.

SECONDARY EXAMINATION

A secondary examination is carried out after the primary examination. It is used to find other injuries that are not obvious and can cause complications to the victim if they are not treated properly.

It is important the **entire** body be checked for trauma; especially when the greatest part of the EMT's attention has been drawn to one specific, dramatic injury. This is particularly true when patients are confused or unconscious due to a head injury. The search for injuries often stops with obvious head injury and, unfortunately, the patient may not be able to tell the EMT about the hip pain or broken tibia/fibula. Therefore, it is important the EMT be thorough with the examination. Hidden injuries can usually be avoided by doing a quick but thorough examination.

COMPLETENESS OF THE EXAMINATION

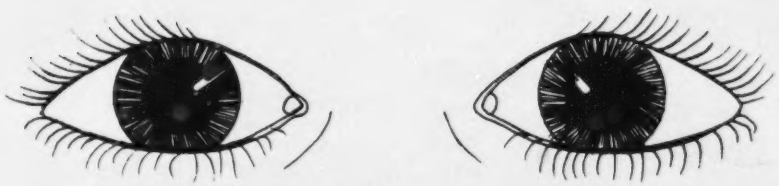
If a patient comes into the emergency department with a sprained ankle, the examination is usually limited to the injured extremity. This type of limited examination is usually appropriate in the field as well. It is important the EMT not forget to take the victim's vital signs. They are taken on every patient in the emergency department and the EMT should take them on every patient in the field. For the most part, it is unnecessary to examine the head and neck or listen to the heart and lungs of somebody who has just sprained an ankle. So it is generally not done. But very often, when a patient is brought to the emergency department, the nature and extent of illness or injury is not clear. The patient may have been involved in a fight or an automobile accident and there may be several injuries, some not obvious. The patient may not reveal the full extent of injury due to the nature of the injury, such as a concussion, which may produce confusion. It is also possible the patient will not reveal the full extent of injury when alcohol or drugs are involved. There may be pre-existing medical problems which need to be discovered, whether or not those medical problems are directly related to the patient's acute problem. For example, complications of diabetes, heart diesease or a stroke can lead to a motor vehicle accident; or the problem may have nothing to do with the accident, but must still be discovered in order to provide treatment.

In all such cases, patient assessment must be a good deal more thorough than in the case of the patient with the sprained ankle. This applies whether the problem is illness or injury. In going through the routine outlined below, it may not be necessary to examine the extremities quite as thoroughly when the history of the problem clearly eliminates any trauma. For example, it is not necessary to palpate clavicles, arms, legs and press on the pelvis of someone complaining only of shortness of breath from an asthma attack. The EMT should be cautious about forgetting or deciding not to do any part of the assessment.

There is a specific procedure to follow when examining a patient. To emphasize this procedure, read the following example of a patient examination. Assume you have little or no information about a patient. As an EMT, you need to get as much information as quickly as possible.

Begin the secondary assessment at the head, moving methodically down toward the feet. Look at the head to see if there is any external evidence of trauma, including bleeding, discoloration or deformities. Check especially for discoloration behind the ears—this is called Battles sign and often means a fracture at the base of the skull—or if any blood or other fluid appears to be coming from the nose or the ears. Look at the pupils, checking for size and symmetry. Are they normal? Dilated? Constricted? Une-

Normal



Dilated

Constricted

Unequal

Figure 3. Reaction of pupils

qual? See Figure 3. Use a light to check for reaction of the pupils. Have the patient look at your finger and check eye movements by moving your finger up, down, left and right. Ask the patient to open the mouth. Look to see if there is any bleeding and/or if any teeth are obviously displaced or chipped.

Remember, while performing various parts of the examination, you are not only gathering information about a particular part of the body, but also about the patient's mental status. For example, when you ask the patient to open the mouth, is the response appropriate?

After you have inspected the face and head, gently but thoroughly palpate the scalp checking for any depressions, undiscovered lacerations, swelling or tenderness. Next, palpate all the facial bones. Unless you have an extremely important reason to put your fingers inside the patient's mouth, such as needing to clear out vomitus or other foreign material, don't do it—unless you are absolutely sure the patient is comatose or alert and friendly.

Quickly check the neck and palpate the posterior cervical area for any tenderness, deformity or muscle spasm. Do not move the neck or attempt to check the range of motion. If the reason for the rescue call does not involve any trauma at all then there is no reason to check cervical range of motion (even though the patient should be allowed the freedom to move the neck). If there is any possibility of cervical trauma, the neck should be immobilized.

Next, attention should be focused on the extremities. Look at the clavicles. Are they symmetrical? Run your fingers quickly over each side, feeling for any deformities or tender areas. Palpate each shoulder. Palpate firmly, gently, quickly, but thoroughly down each arm feeling for deformities, swelling or tenderness. Stop at the wrists and check for the radial pulse, noting both its strength and rhythm. Have the patient grip two of your fingers in each hand. This will give you a fairly good test of grip strength and distal motor function. (It also gives you information about the patient's level of consciousness. Does the patient try to squeeze your hands when asked to do so?) Touch the patient's fingers and ask if the patient feels this.

Palpate the chest wall, feeling for tenderness, crepitations or swelling. Put one hand on each side of the chest wall and press together. Does this produce pain? If so, this may be a sign of a rib fracture. Next, gently palpate the four quadrants of the abdomen, noting whether palpation in any area produces pain.

Then place each hand on the pelvis just above the hip, and press your hands gently but firmly toward one another, just as you did with the chest wall. Now press down on the front of the pelvis on each side. Palpate over each hip and move down each leg.

At the feet, gently scratch, asking if the patient feels this. Finally, ask the patient to wiggle the toes.

Do not forget to examine the back, if this is at all possible. If the patient is sitting, make a quick inspection followed by palpation over the four different quadrants of the back and then up and down the spine. If the patient is lying down, examination of the back can usually wait until the patient is logrolled to be placed on a backboard. Just keep in mind the necessity for examining the back and remember to do it at that time.

The quick assessment examination is sometimes referred to as a "two-minute examination," but that term is misleading. If no abnormalities are encountered, the examination may take one to two minutes. Each abnormality encountered usually adds a little time to the examination; so a properly performed examination may actually take much longer, even when done quickly and competently. Do not focus too much on any particular length of time.

Focus on developing a routine, such as the one described above. Practice it over and over with co-EMTs so that each element of the examination becomes automatic.

NEUROLOGICAL EVALUATION OF CENTRAL NERVOUS SYSTEM INJURIES

The central nervous system consists basically of the brain and spinal cord. The brain is comprised of complex and compact cells responsible for thought, reasoning, coordination of movement, reactions to stimuli, and a host of automatic functions. The spinal cord is a direct extension of the brain and is responsible for movement and sensations. Neurological evaluation is an attempt to determine the functioning or dysfunctioning of primary areas within the nervous system.

This section is intended to provide a guideline for neurological evaluation. TERMINOLOGY IS NOT AS IMPORTANT AS A DESCRIPTION OF WHAT IS SEEN. A deficit may be noted in only one area but once seen may be only the first in a possible deterioration in neurological status. That is why repeated evaluation for change is so important.

DEFINITION

Neurological examination is usually thought of in relation to victims who have reportedly been involved in an accident in which a head injury may be suspected. But others may also require this examination. Any time the nervous system may be involved, whether by injury or by changes in normal body functions, an evaluation of the neurological status must be considered. There are numerous conditions that may result in a change in normal functioning of the central nervous system.

CAUSES

1. Direct blow to the head, with or without penetration
2. Spinal cord injuries
3. Infections—meningitis, encephalitis, abscess formations, severe body infections
4. Ingestions—toxic materials or drugs in improper dosages, especially those with ingredients which affect the central nervous system to some degree
5. Space-occupying lesions—tumors, blood clots, cysts (areas of fluid collection)
6. Disruption of the blood supply to any area of the brain
7. Progressive or prolonged state of hypoxia or anoxia (little or no circulating oxygen supply)
8. Conditions in which general body metabolism is altered, e.g., diabetes, liver damage, kidney damage
9. Interruption of the circulation of the fluid within and around the brain and spinal cord
10. Edema (swelling) of the brain tissue

The brain is encased in the skull which provides a bony protective covering for this vital organ. Much of the damage that occurs to the brain is from progressive swelling and not always the injury itself. Oftentimes there may be no external signs of trauma. Progression of symptoms may not occur until later as swelling progresses. Thus initial neurological checks can provide a baseline for future evaluation. It may also be helpful diagnostically in pinpointing the site and extent of injury before the brain begins to respond to the trauma.

Level of Consciousness--The brain is the seat of consciousness and it possesses the ability to appropriately respond to situations. There are several levels of consciousness that may be seen.

Alert—The victim remains awake or, if sleeping, arouses quickly. Responses are rapid and appropriate.

Combative—The victim is agitated, easily upset, fights when stimulated, yells, often swears, and resists most attempts to be calmed.

Lethargic—The victim appears sleepy or groggy and less interested in surroundings. A mild degree of stimulation is usually required to elicit a response and must frequently be repeated in order to maintain attention. When left alone the sleepiness returns.

Comatose—The victim responds only to marked external stimulation, usually a form of pain. Reactions are abnormal and usually cease once stimulation stops.

EYE CHECKS

From deep within the brain there arise several large nerves that control the eyes. They cause changes in the size of the pupils in response to light and allow the eyes to move in all directions to give a wide range of vision. Any deviation from the expected norm may indicate pressure building along these nerves. One or both sides may be affected.

Pupils—Normally pupils should be equal in size and react briskly when subjected to bright light. Abnormalities that should be noted might be unequal pupils, sluggish reaction, no visible reaction, and/or unusual size (notably constricted or dilated).

Eye Movement—The eyes should move together at the same time and in all directions. When at rest they should be facing forward. Abnormalities that should be noted might be independent motion of the eyes, inability to follow objects in all directions (side-to-side, up and down, near and far), and/or eyes that steadily look in one direction and will not move beyond midline to the opposite direction.

When checking the eyes of a victim who is responsive it is also important to note whether one or both eyelids seem to droop, and/or whether the lids can be closed tightly or opened widely.

DEGREES OF STIMULATION

Voice—The victim arouses to and in some manner acknowledges speech. Most frequently the victim states first name or nickname.

Touch—The victim arouses or responds in some manner when touched.

Pain—The victim requires varying degrees of pain in order to elicit a response. The easiest way to invoke a painful stimulus and subsequent response is by pinching the large muscle in the shoulder that runs from the neck outward. A firm, tight pinch produces a significant degree of pain without bruising or damage. Unless the victim is awake and responsive, a degree of pain is usually necessary to elicit the highest level of response.

MOVEMENT OF EXTREMITIES

The movement of the extremities in response to commands or stimuli is an important factor to evaluate. It may give an indication of the area of the brain or nervous system involved. The type of movement, the extent of movement, and the amount of stimuli required to cause the movement should be noted.

Purposeful—The victim moves correctly in response to a command or any source of stimulation. The more noxious or irritating the stimulus the more the victim tries to withdraw from or remove the source of the irritation.

Semi-purposeful—The victim's movements are random and without apparent direction. The victim may move toward the site of stimulation but is unable to correctly pinpoint the location or source.

Flaccid — The victim now has no response to any stimulus.

VITAL SIGNS

Frequent recording of the vital signs (pulse, respirations, blood pressure) is an integral part of the neurological evaluation.

ADDITIONAL OBSERVATIONS IN THE PRESENCE OF POSSIBLE SPINAL CORD INJURIES

Movement of extremities—Damage to any area of the spinal cord may limit or stop any motion below the site of the injury. Record which extremities are involved and how much limitation is noted.

Response to touch—The spinal cord contains nerves responsible for sensations as well as movement. The victim should be asked to acknowledge the feeling of touch along both the inside and outside of all extremities involved. When possible, the trunk should also be checked for response to touch, starting from the lowest point and working upward along each side, one at a time, to determine at what level touch can be felt. It is important to check both sides because one may be affected more than the other.

As with injuries inside the head that show progressing signs as swelling develops, the spinal cord may also respond in the same manner. Thus the first examinations may prove extremely important diagnostically.

In neurological evaluations it is important not only to record accurately the initial observations and responses but also the repeated checks. Deterioration in any area of neurological function may not be apparent as soon as the injury is sustained or an illness contracted. Maximum care and evaluation for and of treatment has its basis in the continuation of alert and concise evaluation.

Pulse and blood pressure—As pressure increases within the head the body attempts to provide the brain with the circulation required. A combination of responses internally causes the blood pressure to **rise** and the **pulse to slow.** However, other factors may also influence these vital signs. If the change does not follow the pattern previously indicated, it does not necessarily mean a head injury can be ruled out. It means other areas of the body are also affected.

Respirations—This is probably the most important of the vital signs in relation to neurological evaluation. A drop in respiratory rate may be one of the first signs of increasing pressure but equally as important is **any** change in the character of the breathing pattern.

ADDITIONAL OBSERVATIONS

Physical examination—Any external evidence of injury to the head such as bleeding, bruising, discoloration, swelling or irregularity in shape of any portion of the head should be noted. Describe findings and location and extent of injury. Many head injuries, however, may not show any evidence of external damage.

Drainage—Any fluid draining from the ear(s) or nose should be noted. Information should include the site of the drainage, the type or character of the drainage, and the amount. No attempt should be made to limit or halt the drainage. If cerebrospinal fluid (the fluid that circulates within and around the brain and spinal cord) is present in the drainage and attempts are made to stop the flow, there may be a collection along the route of flow; and there exists a possibility of infection which can prove to be disastrous.

Seizures—Any evidence of seizure activity should be recorded. Observations should include a description of the seizure, possible progression of the seizure from one area to another, the length of time the seizure lasted, the frequency of the seizures, movement of the eyes during the seizure, any change in vital signs, and any incontinence (usually of urine) that may have occurred. Neurological evaluations should be re-

peated following all seizures. (Seizures may occur with changes in electrical patterns in the brain.)

Vomiting—Though not always a neurological sign, it may indicate rising pressures within the head.

UNCONSCIOUS PERSONS

DEFINITION

Unconsciousness is the state of being insensible or without conscious experiences.

To describe here all the causes of unconsciousness is not feasible; there are too many and they are too complex.

ESSENTIAL POINTS TO REMEMBER

1. The air exchange is usually poor at some time during the illness or injury.

2. The inhaling of any foreign material may cause death.

a. Check closely for any foreign material in the patient's mouth.

b. Check closely for any vomiting which may bring foreign material into the mouth from the stomach.

3. Since a state of unconsciousness means that all body functions are impaired, respiration may be slower.

4. Always remember that an unconscious victim should be examined carefully for adequate breathing.

5. Check the victim for a medical identification symbol. See Figure 4.

EMERGENCY MEDICAL IDENTIFICATION

RECOGNIZE THIS SYMBOL

This universally recognized symbol is worn or carried by many thousands of people who have pre-existing health problems which may cause or complicate emergency situations. Watch for it.
If you see this symbol, look in the patient's wallet for information about a specific medical condition and be sure to notify hospital emergency personnel.

Figure 4. The universally recognized medical alert symbol

EMERGENCY CARE

Check the victim for any difficulty in air exchange. If difficulty is noted, you must do the following:

1. Immediately insert a plastic, hard rubber, metal or improvised airway. This will keep the relaxed tongue out of the way of the windpipe. The unconscious person can still have a gag reflex. If there should be any sign of gagging, remove the airway immediately. Do not cause the complication of vomiting with the airway. The EMT can then lift up on both sides of the angle of the jaw to create an open airway.

2. If there is any sign of vomiting or coughing up of any foreign material, the victim must be turned to the side immediately. This will facilitate the flow of any foreign materials out of the mouth.

3. It is always a safe practice to support this victim with oxygen. If the victim stops breathing, resuscitate.

MULTIPLE VICTIMS

In the event of a large-scale disaster, or any accident having several victims, the EMT must sort (triage) the victims with the maximum effort being exerted to do the most good for the greatest number. In some cases the entire group can be surveyed simultaneously and the EMTs will stop to treat only those that exhibit life-threatening emergencies.

When confronted with multiple victims, you must use mature judgment and quick sound decisions. Triage should be the responsibility of the person or persons at the scene with the most knowledge and experience.

RESPONDING TO A MULTIPLE VICTIM EMERGENCY SCENE

If the area of the emergency is known, make a mental note of possible hazards that may be encountered and analyze the situation using all available information from the dispatcher. Upon arrival at the emergency scene, it is the responsibility of the first arriving squad to analyze the situation, note all hazards (crowds, traffic, wires, fire, fumes, cave-ins, building collapse, etc.). Call for help if necessary. Use all available resources. Plan entrance and exit route for emergency vehicles. The first emergency squad to arrive at the scene should not transport any victims from the scene but should be utilized as a command post. The personnel should triage and tag (see Figure 5) the victims according to the severity of the injuries. These same personnel shall direct the incoming emergency squad on the priority of the victims to be transported.

The following is a listing that may help you classify victims according to the severity of injuries:

FIRST PRIORITY

Severe airway problems

Cardiac arrest

Uncontrolled bleeding

Severe head injuries

Severe chest injuries

Severe abdominal injuries

Severe shock

Coronaries

Abnormal childbirth (breech, protruding hand or foot, prolapsed cord)

Critical burns

Moderate burns with multiple fractures

Poisoning can also be under this classification if it is severe

SECOND PRIORITY

Moderate burns

Multiple fractures

Back injuries

Normal childbirth

THIRD PRIORITY

Minor burns

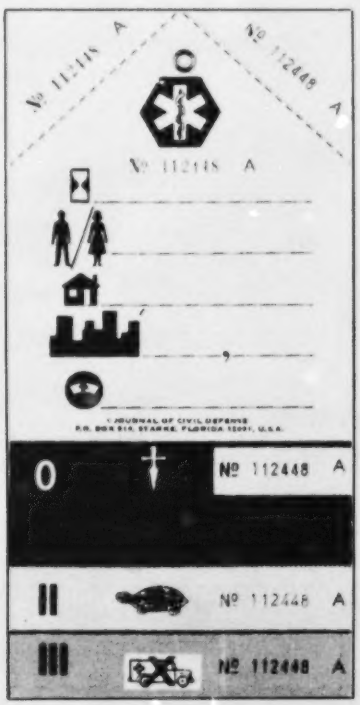
Minor fractures

Minor injuries

Obvious dead

En route to scene of emergency—If area of emergency is known, make a mental note of possible hazards. Analyze the situation, using all available information received from the dispatcher.

On arrival at the emergency scene—Analyze the situation, note all hazards (crowds, traffic, wires, fire, fumes, cave-ins, building collapse, etc). Call for help if necessary. Use all available resources. Plan entrance and exit routes.



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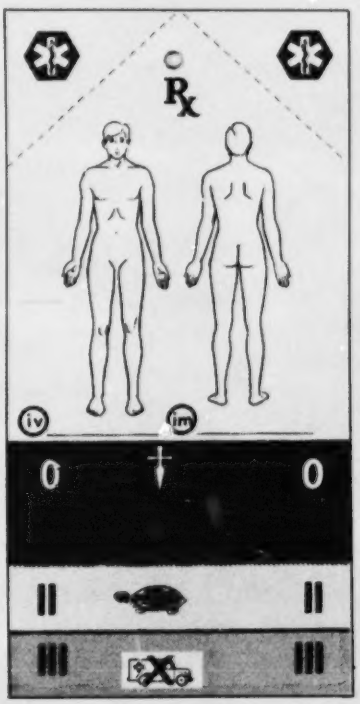

Back

Figure 5. Triage tag

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